ANKIT KUMAR

Systems & Security Researcher • *Secure Intelligent Infrastructure Systems*
IoT Security | Trusted Computing (TEEs) | Edge AI Deployment | Cyber-Physical Systems
NJIT Research Intern (USA) | LU Research Programme (UK) | SIH 2025 National Winner
a.kumar1-26@student.lboro.ac.uk | ankit.kumar.systems@gmail.com | +44 7868349695
linkedin.com/in/ankit7129 | github.com/Ankit7129

RESEARCH EXPERIENCE

Research Visitor — Loughborough University, United Kingdom
UK | Jun 2026 – Jul 2026

AI-Driven Decision Support System for Scheduling and Resource Allocation **Advisor:** Prof. Wenheng Zhang

- **Program Selection:** Secured elite international summer research visitor placement.
- **Constraint Modelling:** Engineered optimization-driven decision architectures under deterministic boundaries.
- **Infrastructure Design:** Developed combinatorial scheduling and allocation schemes for infrastructure.
- **Algorithmic Execution:** Integrated AI workflows with **Google OR-Tools (CP-SAT solver)** engines.

Intern — National Technical Research Organisation (NTRO), India
Delhi, India | Mar 2026 – Jun 2026

Secure Geospatial Infrastructure & National Intelligence Platforms

- **Pipeline Design:** Architected secure geospatial engines and distributed data pipelines.
- **Edge Resilience:** Formulated zero-trust, offline-first workflows optimized for network-denied topographies.
- **Security Integration:** Deployed scalable pipelines fortified with secure infrastructure layers.

Backend Research Intern — New Jersey Institute of Technology (NJIT)
Newark, NJ, USA | Jun – Jul 2025

Secure Document Processing Using Intel SGX Trusted Execution Environments (TEEs) **Advisor:** Prof. Shantanu Sharma

- **Hardware Isolation:** Designed hardware-enforced secure processing backend leveraging **Intel SGX**.
- **Enclave Lifecycle:** Integrated Java backend services with enclaves via **ECALL/OCALL interfaces**.
- **Cloud Infrastructure:** Executed secure compute workloads on **Azure Confidential Computing VMs**.
- **Key Governance:** Implemented enclave-bound key management via **AWS KMS** primitives.
- **Memory Optimization:** Tailored secure vector-processing layers within strict **SGX EPC bounds**.
- **Benchmarking:** Analysed performance regarding enclave memory alignment and runtime execution

Research Collaboration — Wildlife Analytics & Tracking System
Remote | 2026

Under guidance of professor from West Virginia State University (USA) and Heritage Institute of Technology (India)

- **Edge Processing:** Engineered an edge-AI monitoring pipeline deployed on power-constrained **Raspberry Pi** nodes.
- **Foundational Vision:** Curated **4,000 high-quality polygon-based segmentation labels** using **Grounding DINO** and **SAM**.
- **Model Compression:** Applied knowledge distillation to train edge-optimized **YOLO-Seg** variants.
- **Compute Efficiency:** Eliminated GPU reliance, slashing inference overhead for embedded systems.
- **Topology Layout:** Designed distributed architecture pairing edge cameras and mesh networking.

National Participant – National Anveshika Experimental Skill Test
IIT Kanpur & IAPT| 2021

Premier National Physics Architecture & Engineering Competition

- **Competitive Selection:** Passed rigorous national screening rounds open to applicants from Grade 9 up to M.Sc.
- **Analytical Evaluation:** Commended on advanced experimental physics evaluated under **Prof. H. C. Verma (IIT Kanpur)**.

RESEARCH INTERESTS

Hardware Security & Intel SGX
Confidential Computing
Secure Cyber-Physical Systems
IoT Security & Privacy
AI Security & Trustworthy Systems
Smart Infrastructure Security
Edge AI & Embedded Deployment
Digital Twins & Remote Sensing
Geospatial Data Analytics
Decentralized Systems

EDUCATION

Bachelor of Technology — Computer Science Engineering 2023 - 2027
Heritage Institute of Technology, Kolkata (Specialization: IoT & Cybersecurity) **Cumulative GPA: 8.40 / 10.00**
Academic Trajectory: Semester SGPA: 7.90 → 8.02 → **8.79** → **9.00** → 8.06 → **8.65**

Secondary & Senior Secondary (CBSE) 2015 — 2022
Jawahar Navodaya Vidyalaya (Ministry of Education Residential School) 10th Grade: **93.6%** | 12th Grade: **81.4%**
Admitted via JNVST | **Top 2% of 2.4M**+ nationwide applicants to secure a fully funded residential academic fellowship.

PUBLICATIONS

A. Kumar, et al. *"Design and Implementation of a Secure Document Processing System Using Intel SGX."*
NJIT Undergraduate Research Symposium, 2025. Published in *Book of Abstracts 2025 (p. 147)*

- **Hardware Security:** Implemented secure hardware processing frameworks combining SGX, Java, and **AWS KMS**.
- **Enclave Workflows:** Demonstrated enclave-secured encryption and redaction pipelines in untrusted clouds [Details]

SELECTED PROJECTS

NTRO Smart India Hackathon | *Backend Lead* **National Winner (SIH)**

India's Largest Government-Led Innovation Competition

- **Architecture Pivot:** Redesigned system architecture overnight from an online to an offline model under strict constraints.
- **Spatial Ingestion:** Developed scalable backend services for processing massive satellite-derived geospatial data layers.
- **3D Optimization:** Integrated **Three.js** terrain visualization modules to output volumetric analysis calculations.
- **Identity Governance:** Engineered role-based access control (RBAC) with hardened cookie-based authentication.
- **Pipeline Integration:** Collaborated with ML engineering teams to integrate SAR analytics into backend pipelines.
- **Collaboration**: Collaborated with ML team integrating SAR-based analytical pipelines into backend services.

Jambavantha: AI-Powered Smart Irrigation System| *Lead Systems Architect* **Young Innovator (TSEC)**

Young Innovator Award – Tata Social Enterprise Challenge (IIM Calcutta)

- **Prototype Selection***:* Selected to demonstrate a functional cyber-physical prototype at the **8th Inter-College Competition on Prototype Design for Mankind (ICCPDM)**.
- **IoT Automation***:* Designed an automated cyber-physical system integrating environmental sensors with cloud architectures for micro-climate tracking.
- **E*fficiency Systems****:* Programmatically integrated the **OpenWeather API** into real-time closed-loop irrigation hardware to minimize water waste.
- ***National Recognition****:* Awarded the **Young Innovator Award** at the *Tata Social Enterprise Challenge hosted by TATA and IIM Calcutta Innovation Park (IIMCIP)* out of **6,600+ national applications**.

JambaGrad Platform | *Founder & Lead Systems Engineer* **Platform Link**

- **Scale Performance**: Architected and deployed a multi-tenant backend platform serving 1,000+ users across students, clubs, and admins.
- **Domain Structure:** Designed modular, layered backend services using Node.js, Express, and high-throughput MongoDB
- **Threat Monitoring:** Integrated centralized log monitoring pipelines with **Wazuh (SIEM/XDR)** for live threat analysis.
- **Session Security:** Formulated fine-grained RBAC and secure JWT authentication with strict lifecycle governance.

ParkXTwin — Smart Parking Digital Twin | *Systems Co-Lead* **Final Year Project**

- **Twin Architecture:** Designed Digital Twin structures to orchestrate real-time intelligent infrastructure analytics.
- **Predictive Modelling:** Co-engineered parking-demand forecasting workflows achieving **MAE < 2 slots and R^2 > 0.85**.
- **RealTime Tracking**: Designed features supporting occupancy tracking, booking workflows, and infrastructure analytics.

TECHNICAL SKILLS

Trusted Computing & Security	Intel SGX (TEEs), Confidential Computing, Microsoft SEAL, OAuth 2.0, Wazuh (SIEM/XDR)
AI & Edge Intelligence	Grounding DINO, SAM, CLIP, YOLO-Seg, OpenCV, Knowledge Distillation, LLM APIs
Cyber-Physical & Core Systems	IoT Systems, Embedded Microcontrollers, Digital Twins, Google OR-Tools (CP-SAT)
Infrastructure & Languages	Node.js, Java, Python, C/C++, Distributed Backend Architectures, MongoDB, Cloud Platforms

ACHIEVEMENTS & LEADERSHIP

- **National Winner** | Smart India Hackathon (SIH) 2025 (NTRO Category) — *Top 0.002% nationally out of 68k+ teams.*
- **Young Innovators Award** | Tata Social Enterprise Challenge (IIM Calcutta) — *Top 0.05% out of 6,600+ entries*
- **National Participant** | IIT Kanpur Physics Test (NAEST) — *Experimental skills evaluated by Prof. H. C. Verma.*
- **State Rank 4** | Bihar Mathematical Society Olympiad (Class XI)
- **National Sports Representative & Vice-Captain** | XXIX National Handball Meet — *Co-led regional team.*
- **Admitted via JNVST** | Jawahar Navodaya Vidyalaya — *Ranked in top 2% of 2.4 million+ national applicants.*
- **Executive Leadership:** Tech Head at *Dakshh Tech Fest* | Coordinator at *Entrepreneurship Development Cell (HITK)*.
- **Civic Honors:** Rajya Puraskar (Governor's Award) via *Bharat Scouts & Guides* | Active *NCC Cadet*.